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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Ashish Tiwari

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DEBORAH NEVILLE

P.O. BOX 61063

PALO ALTO, CA 94306

EXAMINER

PIERRE LOUIS, ANDRE

ART UNIT

PAPER NUMBER

2123

MAIL DATE

DELIVERY MODE

04/09/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/775,419	Applicant(s) TIWARI ET AL.	
	Examiner ANDRE PIERRE LOUIS	Art Unit 2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 December 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. The amendment filed on 12/27/2007 has been received and fully considered; claims 1-9 are presented for examination.

Response to Arguments

2. Applicant's arguments filed 12/27/2007 have been fully considered but they are not persuasive.

2.1 Applicant argues that neither Bultan nor Vangheluwe teaches or suggest the constructing and saturating steps of the claims and that that neither Hsieh nor Vangheluwe teaches or suggest the constructing and saturating steps of the claims, the Examiner respectfully disagrees and notes that Bultan's *pages 753-754*, just to name a few, does substantially show the construction of a model used in formal analysis, such as a Model checker using the symbolic representation and Hsieh et al., used in the secondary rejection and further relied upon for support in rejecting the claims, substantially teaches the construction of a model used for formal analysis (*see for example pg.141-144*). Vangheluwe, used as a secondary reference in the rejection of the claims, does substantially teach the saturation of a set of polynomials (*see for example, pgs.101-105, and 109, just to name a few*).

2.2 While the applicant believes that the independent claims, along with the dependent claims should be found allowable, the examiner respectfully disagrees and asserts that the combined references cited teach the entire claimed invention. *Applicant is further encouraged to look at the new references not used shown in the conclusion section of this and previous office*. However, the grounds of rejections below fully support the Examiner's position in rejecting the instant claims.

Claim Objections

3. Claim 1 is objected to because of the following informalities: While the claim recites “the polynomials contained in the property of interest and the hybrid system”, it’s unclear what these polynomials are, as the claim does not previously describe any polynomials of any kind contained in the property of interest and the hybrid system”, further clarification requested and/or Appropriate correction is required.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4.0 Claims 1-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bultan et al. (ACM Transaction 1999, Model-checking of Concurrent Systems with Unbounded Integer Variable: Symbolic Representations, Approximation, and Experimental Results), in view Multi-Formalism Modelling and Simulation, by Hans Vangheluwe (2000-2001).

4.1 In considering claim 1, Bultan et al. substantially teaches a method of constructing an abstract discrete system suitable for formal analysis from a hybrid system, with respect to a property of interest, said method comprising the steps of: a) selecting a set of polynomials from the polynomials contained in the property of interest and the hybrid system

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(pg.751-753); c) constructing the abstract discrete system over a set of abstract states defined by the positive, negative and zero valuation of the saturated set of polynomials (pg.751-754, 768-772); d) storing the abstract discrete system (pg.759-761,766). However, Bultan et al. does not expressly teach the step of b) saturating the selected set of polynomials; but Vangheluwe substantially teaches a step of saturating the set of polynomials (pg.101-105, 190). Vangheluwe further teaches constructing an abstract discrete model (see pg.139-140, 146-147). Bultan et al. and Vangheluwe are analogous art because they from the same field of endeavor and that the modelling and simulation teaches by Vangheluwe is similar to that of Bultan et al. Therefore, it would be obvious to one ordinary skilled in the art to combine the modelling and simulation system teaches by Vangheluwe with the model checking system of Bultan et al. because Vangheluwe teaches advantage of achieving tremendous flexibilities (pg. 170), and many other advantages can be found on page 93-94.

4.2 As per claim 2, the combined teachings of Bultan et al. and Vangheluwe substantially teach that the step of saturating the selected set of polynomials is stopped before normal termination (see Vangheluwe pg.175-177, also see Bultan et al. 775).

4.3 As per claim 3, the combined teachings of Bultan et al. and Vangheluwe substantially teach that the hybrid system has no discrete components (see Bultan et al. pg. 752-754, 764-768; also see Vangheluwe pg.22, 59).

4.4 As per claims 4, the combined teachings of Bultan et al. and Vangheluwe substantially teach that eigenvectors are used to generate polynomials (see Vangheluwe pg.118, also see Bultan et al. pg. 762-768).

4.5 With regards to claim 5, the combined teachings of Bultan et al. and Vangheluwe substantially teach a method for determining the validity of a property of interest with respect to a hybrid system, said method comprising the steps of: a) abstracting the hybrid system to create an abstract discrete system (*see Vangheluwe pg.139-140, 146-147*), wherein abstracting comprises constructing an abstract system over a set of abstract states defined by positive, negative, and zero valuation of a saturated set of polynomials constructed by saturating an initial set of polynomials selected from the polynomials contained in the property of interest and the hybrid system (*see Vangheluwe pg.7; also see Bultan et al. pg.751-754*); b) analyzing the validity of the property of interest with respect to the abstract discrete system (*see Bultan et al. 751-753 and 764-768; also see Vangheluwe pg.145-150*); outputting the validity of the property of interest (*see Vangheluwe pg.6-12,19,25; also see Bultan et al. pg.764,773*).

4.6 Regarding claim 6, the combined teachings of Bultan et al. and Vangheluwe substantially teach that the property of interest is invalid with respect to the abstract discrete system, creating a finer abstraction of the hybrid system and analyzing the property of interest with respect to the finer abstraction (*see Bultan pg.751, 760-773; also see Vangheluwe pg.11, 12, 29, 52-56*).

4.7 As per claim 7, the combined teachings of Bultan et al. and Vangheluwe substantially teach that analyzing the validity of the property of interest is performed by model checking (*see Bultan et al. title, pg.752, 764; also see Vangheluwe pg.7, 145-50*).

5. Claim 1-7 is further rejected under 35 U.S.C. 103(a) as being unpatentable over Hsieh et al. (IEEE 1998, Model abstraction for formal verification), in view Multi-Formalism Modelling and Simulation, by Hans Vangheluwe (2000-2001).

5.1 In considering claim 1, Hsieh et al. substantially teaches a method of constructing an abstract discrete system suitable for formal analysis from a hybrid system, with respect to a property of interest, said method comprising the steps of: a) selecting a set of polynomials from the polynomials contained in the property of interest and the hybrid system (*pg.140-143*); c) constructing the abstract discrete system over a set of abstract states defined by the positive, negative and zero valuation of the saturated set of polynomials (*pg.140-143*); d) storing the abstract discrete system (*pg.145*). However, Hsieh et al. does not expressly teach the step of b) saturating the selected set of polynomials; but Vangheluwe substantially teaches a step of saturating the set of polynomials (*pg.101-105, 190*). Vangheluwe further teaches constructing an abstract discrete model (*see pg.139-140, 146-147*). Hsieh et al. and Vangheluwe are analogous art because they from the same field of endeavor and that the modelling and simulation teaches by Vangheluwe is similar to that of Hsieh et al. Therefore, it would be obvious to one ordinary skilled in the art to combine the modelling and simulation system teaches by Vangheluwe with the model checking system of Hsieh et al. because Vangheluwe teaches advantage of achieving tremendous flexibilities (*pg.170*), and many other advantages can be found on page 93-94.

5.2 With regards to independent claim 5, the combined teachings of Hsieh et al. and Vangheluwe substantially teach a method for determining the validity of a property of interest with respect to a hybrid system, said method comprising the steps of: a) abstracting the hybrid system to create an abstract discrete system (*see Vangheluwe pg.139-140, 146-147*), wherein abstracting comprises constructing an abstract system over a set of abstract states defined by positive, negative, and zero valuation of a saturated set of polynomials constructed by saturating an initial set of polynomials selected from the polynomials contained in the property of interest

and the hybrid system (*see Vangheluwe pg.7, 139-140, 146-147; also see Hsieh et al. pg.140-147*); b) analyzing the validity of the property of interest with respect to the abstract discrete system (*see Hsieh et al. pg.140-141; also see Vangheluwe pg.145-150*); outputting the validity of the property of interest (*see Vangheluwe pg.6-12,19,25; also see Hsieh et al. pg.144*).

6. Claims 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bultan et al., in view of Multi-Formalism Modelling and Simulation, by Hans Vangheluwe (2000-2001), as applied to claims 1-7 above, and further in view of Lincoln et al. (USPG_PUB No. 2003/0033126).

6.1 Regarding claims 8-9, Bultan et al., as modified by Vangheluwe, teaches most of the instant invention; however, he does not expressly teach that the hybrid system is a model of a biological system. Lincoln et al. substantially teaches that the hybrid system is a model of a biological system (see Title). Lincoln et al., Bultan et al., and Vangheluwe are analogous art because they are from the same field of endeavor and that the model analyses by Lincoln et al. is similar to that of Bultan et al. and Vangheluwe. Therefore, it would have been obvious to one ordinary skilled in the art at the time of the applicant's invention to combine the biological system modeling of Lincoln et al. with the Model checking system of Bultan et al., and the modelling and simulation system of Vangheluwe because Lincoln teaches the advantage of decision diagram for efficiency manipulation and representation and the improvement of efficiency (*para 0090*), and Vangheluwe teaches advantage of achieving tremendous flexibilities (*pg. 170*), and many other advantages can be found on page 93-94.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

7.1 Thalhammer-Reyero (U.S. Patent No. 6, 983,227) teaches a virtual models of complex system.

8. Claims 1-9 are rejected and **THIS ACTION IS MADE FINAL**. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andre Pierre-Louis whose telephone number is 571-272-8636. The examiner can normally be reached on Mon-Fri, 8:00AM-4:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul L. Rodriguez can be reached on 571-272-3753. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/A. P. L/

Examiner, Art Unit 2123

April 7, 2008

/Paul L Rodriguez/

Supervisory Patent Examiner, Art Unit 2123